

Same-day discharge after unilateral parathyroidectomy is safe

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Background: Minimally invasive parathyroidectomy (MIP) with intraoperative parathyroid hormone monitoring is the most common surgical approach among endocrine surgeons for primary hyperparathyroidism (PHPT). Overnight hospitalization after MIP represents a drain on resources and may be unnecessary. The aim of this study was to determine the safety of same-day discharge after MIP.

Methods: We performed a retrospective cohort study of patients treated for PHPT between August 2010 and July 2015. Patients were stratified by their length of stay in hospital and compared in terms of postoperative complications.

Results: During the study period 154 MIPs were performed. Of these, 101 patients were discharged on the day of their surgery (group 1) and the remaining 53 stayed 1 or more days (group 2). Three patients in group 2 required readmission within 30 days of discharge ($p = 0.039$). Seven patients in group 1 and 1 patient in group 2 visited the emergency department within 30 days of discharge ($p = 0.72$). Two patients in group 1 experienced persistent or recurrent PHPT ($p = 0.55$). Patients in group 2 were older than those in group 1 (69 v. 61 yr, $p < 0.001$) and had a higher mean American Society of Anesthesiologists classification of physical status (2.66 v. 2.24, $p < 0.001$).

Conclusion: Same-day discharge after MIP is a safe practice and saves the cost of an overnight stay in hospital. Same-day discharge should be considered for all patients undergoing MIP if there are no clear indications for overnight hospitalization.

Contexte : La parathyroïdectomie à effraction minimale avec surveillance peropératoire de la parathormone est la technique chirurgicale la plus employée par les chirurgiens endocriniens pour traiter l'hyperparathyroïdie primaire. L'hospitalisation d'une nuit suivant cette intervention, qui englobait des ressources considérables, pourrait ne pas être nécessaire. La présente étude visait donc à déterminer la sécurité des chirurgies d'un jour dans ce contexte.

Méthodes : Nous avons mené une étude de cohorte rétrospective portant sur les patients qui avaient subi l'intervention entre août 2010 et juillet 2015. Après avoir stratifié les patients selon la durée de leur séjour à l'hôpital, nous avons comparé l'incidence de complications postopératoires.

Résultats : Au cours de la période visée, 154 parathyroïdectomies à effraction minimale ont été pratiquées. De ces 154 patients, 101 ont reçu leur congé le jour même (groupe 1), tandis que les 53 autres ont été hospitalisés 1 journée ou plus (groupe 2). Dans les 30 jours suivant leur congé, 3 patients du groupe 2 ont dû être réhospitalisés ($p = 0,039$), tandis que 7 patients du groupe 1 et 1 patient du groupe 2 se sont rendus à l'urgence ($p = 0,72$). Deux patients du groupe 1 ont continué de présenter une hyperparathyroïdie primaire persistante ou récurrente ($p = 0,55$). Les patients du groupe 2 étaient plus âgés que ceux du groupe 1 (69 ans contre 61 ans; $p < 0,001$) et appartenaient à une catégorie plus élevée du système de classification de la santé physique de l'American Society of Anesthesiologists (2,66 contre 2,24; $p < 0,001$).

Conclusion : Il est donc sécuritaire de donner leur congé le jour même aux patients qui subissent une parathyroïdectomie à effraction minimale. Cette pratique, qui permet d'éviter les coûts associés à une hospitalisation, devrait être envisagée pour tous les patients, sauf en cas d'indication claire d'hospitalisation.

Primary hyperparathyroidism (PHPT) is the most common cause of hypercalcemia in the outpatient setting, with an annual incidence of 0.2%.¹ Approximately 85% of cases of PHPT are caused by a single parathyroid adenoma, while the remainder are caused by multigland disease or parathyroid carcinoma.² While bilateral 4-gland exploration has historically been the gold standard surgical approach, most endocrine surgeons favour a minimally invasive parathyroidectomy (MIP), given the low frequency of multigland disease.³

Traditionally, patients are monitored overnight following MIP, but a recent study from the United Kingdom has begun to explore the feasibility of same-day discharge after this operation.⁴ The safety of this practice has not been well studied in the Canadian context. The purpose of our study was to document the safety of a same-day discharge protocol following MIP at an urban Canadian centre.

METHODS

Study cohort

We retrospectively reviewed the charts of patients who received parathyroidectomies performed by a single endocrine surgeon between August 2010 and June 2015 at St. Paul's Hospital, Vancouver, BC, and patients were stratified into 2 groups based on their length of stay (LOS). Patients in group 1 were discharged on the same day as the operation after 4 hours of observation, whereas patients in group 2 were hospitalized for at least 1 night after their MIP. Reasons that group 2 patients were admitted overnight included the following: the procedure was performed too late in the evening to allow for same-day discharge, there was an ongoing need for cardiorespiratory monitoring after general anesthetic, the procedure was performed on an inpatient basis, the patient was from a distant geographic location, and no ride home was available on the day of the procedure.

Only patients undergoing MIP were included in the data analysis. Patients undergoing reoperation or bilateral parathyroid exploration were excluded. In addition, patients undergoing concomitant procedures were also excluded, unless that operation was an ipsilateral cervical procedure, such as a thyroid lobectomy. The study protocol was approved by our institutional ethics review board.

Minimally invasive parathyroidectomy

As described by Chen and colleagues,⁵ MIP involves preoperative localization of the target adenoma using a sestamibi scan and ultrasound, directed exploration of the imaged gland through a 2 cm incision, and the use of intraoperative parathyroid hormone (ioPTH) measurement to confirm the absence of multigland disease.⁵ All patients stayed at least 4 hours postoperatively and were

then examined for hematoma or other acute complications before discharge. There is no specific enhanced recovery after surgery (ERAS) pathway for MIP patients, nor an established protocol for area hospitals for hematoma management. However, each patient is counselled extensively by the attending surgeon before discharge, and an information pamphlet is provided upon discharge. Specifically, patients are counselled on wound care, signs of hematoma requiring urgent presentation to the nearest hospital, and symptoms of hypocalcemia necessitating institution of oral calcium supplementation and a phone call to the surgeon's office. A more extensive information pamphlet that will be distributed to patients preoperatively is currently under development. All patients were seen in follow-up 2 weeks and 6 months after discharge.

Study comparison

Demographic information including patient age, sex, distance between home address and the hospital, and American Society of Anesthesiologists (ASA) physical status classification was recorded to identify potential confounding variables. Operative details, including location of adenoma and ioPTH levels were also recorded. We compared postoperative mortality and rates of the following complications between the 2 groups: hematoma, wound infection, permanent recurrent laryngeal nerve (RLN) paralysis, permanent hypoparathyroidism, persistent/recurrent PHPT, visits to the emergency department (ED) within 30 days of discharge, and rehospitalization within 30 days of discharge. Additionally, we recorded the duration of follow-up and serum calcium and PTH levels at or after 6 months postoperatively.

Statistical analysis

We analyzed differences between groups using the Fisher exact test for categorical variables and the Student *t* test for continuous variables. We considered results to be significant at $p < 0.05$.

RESULTS

During the study period, 217 patients underwent cervical parathyroidectomy for treatment of PHPT. After excluding 48 patients who underwent bilateral explorations, 14 patients who underwent reoperative surgery and 1 patient who underwent a concomitant procedure not in the ipsilateral neck, 154 patients were left for analysis (Fig. 1). Stratification of these patients by LOS resulted in 101 patients who were discharged on the same day (group 1), and 53 patients who stayed 1 or more days in hospital (group 2). The mean duration of follow-up in each group was 7 months.

Demographic comparison of the study groups showed that group 2 patients were older ($p < 0.001$) and had higher

ASA scores ($p < 0.001$) than patients in group 1. There was also a trend toward group 2 patients living farther away from the hospital than group 1 patients (Table 1).

There was 1 death in group 2 ($p = 0.34$). This patient had been admitted to hospital 6 weeks before the diagnosis of PHPT after a fall. The MIP occurred as an inpatient procedure and was tolerated well without complications. The patient succumbed to nosocomial *Clostridium difficile* infection on postoperative day 69.

There were no instances of hematoma, wound infection, permanent hypoparathyroidism or permanent RLN paralysis in either group (Table 2). Two patients from group 1 had persistent or recurrent disease ($p = 0.55$); 1 of them had disease recurrence secondary to parathyroid carcinoma and the other had persistently elevated PTH levels despite being normocalcemic and having an ioPTH reduction greater than 50%. Ultimately the latter of these patients went on to have another parathyroid exploration, and a double adenoma was found on the contralateral side.

Eight patients visited the ED within 30 days of their discharge: 7 from group 1 and 1 from group 2; however, this difference was not significant ($p = 0.72$). The majority of the 8 patients who visited the ED were seen for cardiorespiratory conditions not related to their recent operation. Three patients visited the ED with paresthesias, but all were found to have normal calcium levels. Table 3 outlines the reasons for the ED visits.

Interestingly, all 3 patients who were readmitted to hospital within 30 days of discharge belonged to group 2, and

this was the only statistically significant difference in complication rates between the groups ($p = 0.039$). One patient was admitted for a dysrhythmia that pre-existed MIP, 1 patient was admitted for a mechanical back injury, and the third was a patient with paresthesias but normal calcium who was admitted overnight for anxiety.

DISCUSSION

The results of our study reveal no significant increase in complications with same-day discharge following MIP. Upon examination of the complications that did arise after surgery, many could be attributed to reasons other than the recent MIP. Most of our patients who were readmitted to hospital or who were seen in the ED within 30 days of their MIP presented for reasons unrelated to their parathyroid surgery with the exception of 3 patients who presented with paresthesias. However, all 3 of these patients were found to be normocalcemic, as one would expect given that only a unilateral parathyroid exploration was performed and only a single adenoma was resected. This suggests that there is no increased risk of postoperative complications with same-day discharge following MIP when compared with an overnight stay.

In group 1, 7 patients visited the ED postoperatively compared with only 1 patient in group 2. Though this was not a statistically significant difference, it may reflect the impact of geography on how patients access care postoperatively. The majority of these visits were cardiorespiratory

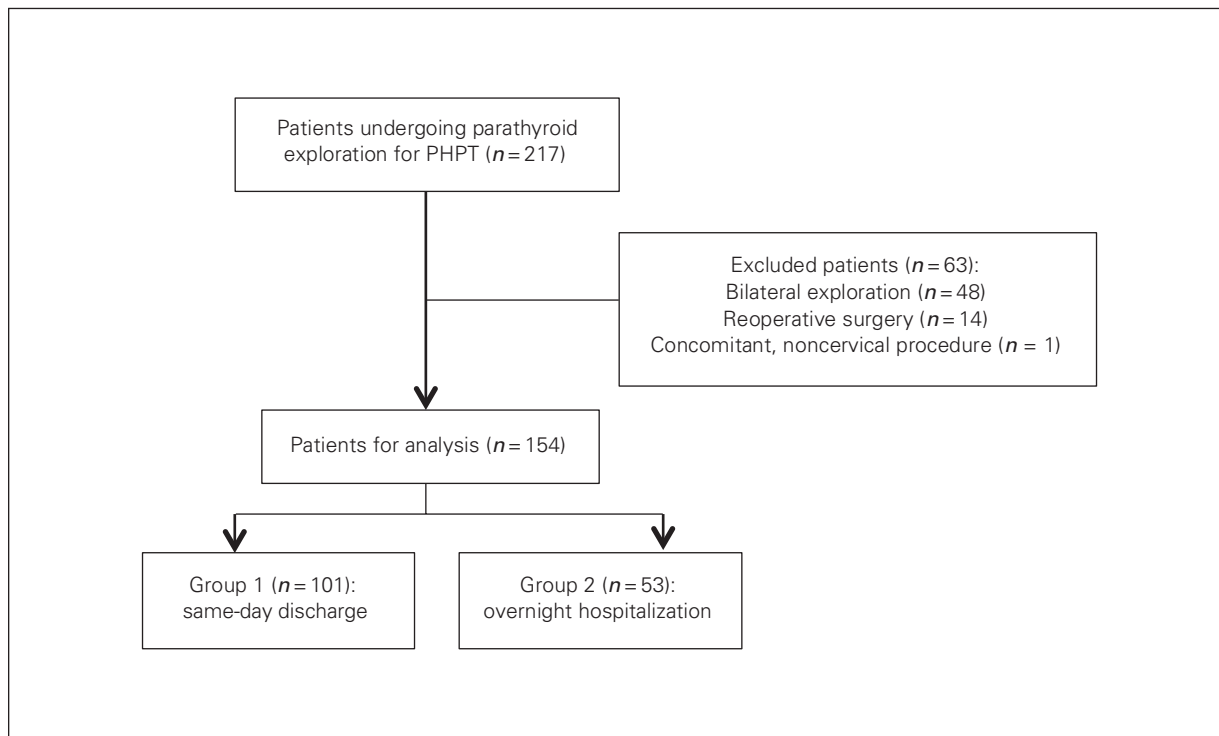


Fig. 1: Selection of patients for participation in the study. PHPT = primary hyperparathyroidism.

issues that could have been investigated by a primary care physician outside of the ED. However, demographic analysis of our groups revealed a trend toward group 1 patients tending to live closer to the hospital than group 2 patients. Though not formally investigated by this study, we speculate that patients who live close to the hospital choose to visit the ED rather than their primary care physicians postoperatively, whereas patients who live farther away prefer their primary care physicians. The time of presentation may also dictate where a patient chose to present (e.g., presenting with concerns to the ED at night when the primary care physician's office is closed). There are multiple factors affecting access to care postoperatively, and this was beyond the scope of this study.

Table 1. Demographic and clinical characteristics of study participants

Characteristic	Group 1 (n = 101)	Group 2 (n = 53)	p value
Mean age, yr	61	69	< 0.001
Mean ASA score	2.24	2.66	< 0.001
Female sex, %	76	74	0.85
Mean driving distance from home to hospital, km	77.3	114.3	0.44

ASA = American Society of Anesthesiologists.

Table 2. Comparison of postoperative complications among study participants

Complication	Group 1 (n = 101)	Group 2 (n = 53)	p value
Hematoma	0	0	N/A
Wound infection	0	0	N/A
RLN palsy	0	0	N/A
Hypoparathyroidism	0	0	N/A
Persistent/recurrent PHPT	2	0	0.55
ED visit within 30 d	7	1	0.72
Readmission within 30 d	0	3	0.039
Death	0	1	0.34
All-cause complication	9	5	> 0.99

ED = emergency department; N/A = not applicable; PHPT = primary hyperparathyroidism; RLN = recurrent laryngeal nerve.

Table 3. Postoperative ED visits within 30 days

Patient	Reason for ED Visit	Group
1	Chest pain, workup negative, not admitted	1
2	Palpitations workup negative, not admitted	1
3	Dyspnea, workup negative, not admitted	1
4	Dyspnea, workup negative, not admitted	1
5	Renal colic, not admitted	1
6	Paresthesias, Ca2+ normal, not admitted	1
7	Paresthesias, Ca2+ normal, not admitted	1
8	Paresthesias, Ca2+ normal, admitted for anxiety	2

ED = emergency department.

Demographic comparison of sample groups revealed a significant difference in age and ASA classification status. While these differences are not the result of randomization, they serve to demonstrate features of a population that required longer hospitalization after MIP at our centre. Older patients, patients with greater comorbid disease burden, and patients undergoing bilateral excision may not benefit from same-day discharge as reliably. For this reason, we suggest same-day discharge be considered for all patients undergoing MIP, but acknowledge that overnight hospitalization may be required in certain populations for the reasons outlined above.

Currently, MIP is the preferred approach in the majority of cases of PHPT for its improved cost-effectiveness and cosmesis.^{6,7} Udelsman³ reported in 2002 that MIP without overnight hospitalization confers a 50% reduction in operating time and a savings of \$USD 2693 per procedure, with a reduction in complications compared with bilateral explorations.³ To our knowledge, there is no Canadian study on the cost-effectiveness of MIP, and a cost analysis was beyond the scope of the present study; however, a similar trend would be expected.

Same-day discharge following parathyroidectomy has found support in recent literature. In the European context, same-day discharge has been explored following thyroid and parathyroid surgery with some success. Rajeev and colleagues⁴ found that parathyroidectomy with same-day discharge was suitable in select patient populations. The authors of that study reported no increased risk of hematoma or severe complications for patients discharged on the day of surgery. However, the authors did note a concern about hypocalcemia postoperatively, which was likely explained by the inclusion of patients undergoing bilateral parathyroid exploration in their study.⁴

Flynn and colleagues⁸ recently reported that same-day discharge after parathyroidectomy is a safe option compared with overnight hospitalization. However, they found that outpatient parathyroidectomy tends to occur more frequently in patients with few comorbidities, whereas more complex patients tend to be kept overnight in hospital. These findings are useful in identifying a population that may benefit from same-day discharge and mirror our own results that patients requiring overnight stay tend to have more comorbidities and be older. In addition, Flynn and colleagues⁸ found that the majority of outpatient parathyroidectomies tended to be MIP procedures. They also observed no difference in driving distance from home to hospital in the American context, but our findings suggest that geography may indeed play a role in the surgeon's decision to hospitalize patients following MIP in the Canadian context. Together, these findings suggest that same-day discharge after MIP may be a safe option, but their study design does not demonstrate this explicitly. Our findings more directly show that same-day discharge after MIP is safe, and, to our

knowledge, our study is the first to demonstrate this in the Canadian context.

Limitations

Despite strong evidence in favour of same-day discharge and MIP, no consensus guidelines or patient-care pathways have been produced at our centre or elsewhere to direct care. The results of our study may contribute to this mounting evidence, but we are limited in the data produced by retrospective analysis. Further limitations of our study include our relatively small sample size, limited generalizability given that our study reflects the practice of a single surgeon, and the potential for information bias given our retrospective study design. In addition, patients did not routinely undergo laryngoscopy postoperatively, so rates of permanent RLN injury may have been underestimated.

CONCLUSION

Our study has shown that same-day discharge has no increased risk of adverse events following MIP. This non-inferiority makes same-day discharge favourable, especially when considering the cost of an overnight stay in hospital. We recommend that same-day discharge be considered for all patients undergoing MIP, though older patients, patients with more significant comorbidities, or patients with geographic burdens should be considered for an overnight stay.

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Competing interests: None declared.

Contributors: A. Melck designed the study. Both authors acquired and analyzed the data, wrote and reviewed the article and approved the final version for publication.

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